

Appl. No. : 10/022,297

Filed : December 12, 2001

AMENDMENTS TO THE CLAIMS

The following listing of claims replaces all prior versions of the claims and any prior listing of the claims in the present application. In the following listing, Claim 17 is canceled herein without prejudice, and Claims 2 and 3 were previously canceled. Claims 5, 8, 13, 16, 18-20 and 22 are amended herein. Claims 1, 4, 6, 7, 9-12, 14, 15, 21 and 23-26 remain as originally filed or as previously amended.

02
Claim 1 (Previously Amended): A semiconductor device comprising a substrate, a land formed on the substrate, a semiconductor chip mounted on the land, a solder layer only through which the semiconductor chip is joined with the land, and a synthetic resin covering the land, the solder layer and the semiconductor chip on the substrate, a coefficient of expansion of the synthetic resin being generally less than a coefficient of expansion of the substrate or a coefficient of expansion of the land.

Claim 2 (Previously Canceled)

Claim 3 (Previously Canceled)

Claim 4 (Previously Amended): A semiconductor device comprising a substrate, the substrate comprising aluminum, a land formed on the substrate, a semiconductor chip mounted on the land, a solder layer only through which the semiconductor chip is joined with the land, and a synthetic resin covering the land, the solder layer and the semiconductor chip on the substrate, a coefficient of expansion of the synthetic resin being generally less than a coefficient of expansion of aluminum.

Claim 5 (Currently Amended): The semiconductor device as set forth in Claim 4, wherein the coefficient of the ~~linear~~ expansion of the synthetic resin is generally less than approximately 23 ppm/°K.

Claim 6 (Previously Amended): The semiconductor device as set forth in Claim 4, wherein the land comprises copper.

Appl. No. : 10/022,297
Filed : December 12, 2001

Claim 7 (Previously Amended): The semiconductor device as set forth in Claim 4, wherein the synthetic resin includes epoxide.

Claim 8 (Currently Amended): A semiconductor device comprising a substrate, a land formed on the substrate, a semiconductor chip mounted on the land, a solder layer only through which the semiconductor chip is joined with the land, and a synthetic resin ~~covering~~ that covers the land, the solder layer and the semiconductor chip on the substrate, ~~a coefficient of expansion of the synthetic resin having a coefficient of expansion, the coefficient of expansion of the synthetic resin~~ being generally less than a larger one of a coefficient of expansion of the substrate and a coefficient of expansion of the land, and the coefficient of expansion of the resin being generally greater than ~~the other~~ a smaller one of the coefficient of expansion of the substrate and the coefficient of expansion of the land.

Claim 9 (As Originally Filed): The semiconductor as set forth in Claim 8, wherein the coefficient of expansion of the synthetic resin is less than the coefficient of expansion of the substrate and is greater than the coefficient of expansion of the land.

Claim 10 (As Originally Filed): The semiconductor as set forth in Claim 8, wherein the coefficient of expansion of the synthetic resin is less than the coefficient of expansion of the land and is greater than the coefficient of expansion of the substrate.

Claim 11 (As Originally Filed): The semiconductor as set forth in Claim 8, wherein the substrate comprises aluminum.

Claim 12 (As Originally Filed): The semiconductor device as set forth in Claim 11, wherein the coefficient of the expansion of the synthetic resin is generally less than a coefficient of expansion of aluminum.

Claim 13 (Currently Amended): The semiconductor device as set forth in Claim 1, wherein the semiconductor chip defines at least two corners positioned generally opposite to each other, the land has an outer boundary that defines at least two ~~corners~~ corner portions in proximity to the


Appl. No. : 10/022,297

Filed : December 12, 2001

corners of the semiconductor chip, the outer boundary further defines contiguous portions extending next to the corner portions and spaced apart from the semiconductor chip more than the corner portions, and the ~~corners~~ corner portions of the land generally confine the corners of the semiconductor chip therein.

Claim 14 (As Originally Filed): The semiconductor device as set forth in Claim 1, wherein the semiconductor chip controls electric power.

Claim 15 (As Originally Filed): The semiconductor device as set forth in Claim 14, wherein the semiconductor chip controls power of an electric motor arranged to drive an electric vehicle.

 Claim 16 (Currently Amended): A semiconductor device comprising a substrate, a land formed on the substrate, a semiconductor chip mounted on the land, a solder layer joining the semiconductor chip with the land, the semiconductor chip defining at least two corners positioned generally opposite to each other, the land having an outer boundary defining at least two ~~corners~~ corner portions disposed in proximity to the corners of the semiconductor chip, the outer boundary further defining contiguous portions extending next to the corner portions and spaced apart from the semiconductor chip more than the corner portions, the ~~corners~~ corner portions of the land generally confining the corners of the semiconductor chip therein.

Claim 17 (Currently Canceled)

Claim 18 (Currently Amended): The semiconductor device as set forth in Claim 16, wherein the semiconductor chip is generally configured as a ~~rectangular~~ shape having at least one diagonal line, and the corners of the semiconductor chip are positioned on a the diagonal line of the ~~rectangular~~ shape.

Claim 19 (Currently Amended): The semiconductor device as set forth in Claim 18, wherein the semiconductor chip defines four corners, and the land defines four ~~corners~~ corner portions corresponding to the corners of the semiconductor chip.

Appl. No. : 10/022,297

Filed : December 12, 2001

Claim 20 (Currently Amended): The semiconductor device as set forth in Claim 18, wherein the semiconductor chip is generally configured as a rectangular shape, and wherein at least a length of a shorter side of the rectangular shape is longer than approximately 2.5 millimeters.

Claim 21 (Currently Amended): The semiconductor device as set forth in Claim 16, wherein the land is generally configured as a rectangular shape except for the ~~corners~~ corner portions.

Claim 22 (Currently Amended): The semiconductor device as set forth in Claim 16, wherein the land is generally configured as a round shape except for the ~~corners~~ corner portions.

12
Claim 23 (As Originally Filed): The semiconductor as set forth in Claim 16, wherein an area of the land is larger than an area of the semiconductor chip, and the area of the land generally shrinks toward the corners of the semiconductor chip.

Claim 24 (As Originally Filed): The semiconductor as set forth in Claim 16, wherein an area of the land is larger than an area of the semiconductor chip, and the area of the land generally expands from the corners of the semiconductor chip.

Claim 25 (As Originally Filed): The semiconductor device as set forth in Claim 16, wherein the semiconductor chip controls electric power.

Claim 26 (As Originally Filed): The semiconductor device as set forth in Claim 16, wherein the semiconductor chip is joined with the land in a reflow soldering method.

Claims 27-32 (Previously Canceled)

Appl. No. : 10/022,297

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SUBMISSION OF SUBSTITUTE SHEET OF FORMAL DRAWINGS

In response to the previous Office Action, Applicants requested approval to correct Figure 6. In the March 11, 2003 Office Action, the Examiner approved the proposed correction and required Applicants to submit a corrected drawing in reply to the Office Action.

Applicants are submitting herewith a replacement drawing sheet comprising Figures 6, 7 and 8. Figures 7 and 8 appear as originally filed. Figure 6 includes the correction approved by the Examiner.

Applicants respectfully submit that the enclosed replacement drawing sheet is fully responsive to the drawing requirement in the March 11, 2003 Office Action.